TETRA TECH

TECHNICAL MEMORANDUM

To:	Nevada Environmental Response Trust
Cc:	Dan Pastor, Tetra Tech, Inc.
From:	April Hussey
Date:	August 20, 2018
Subject:	Operation and Maintenance Summary – July 2018 Weir Dewatering Treatment Plant Nevada Environmental Response Trust; Henderson, Nevada

The Southern Nevada Water Authority (SNWA) is completing two weir construction projects in the Las Vegas Wash, the Sunrise Mountain Weir and Historic Lateral Weir. SNWA has hired a construction company, Las Vegas Paving (LVP) to perform weir construction activities. This includes constructing diversion channels to divert the Las Vegas Wash and perform construction dewatering activities. The Nevada Environmental Response Trust (NERT or Trust) has been ordered by the Nevada Division of Environmental Protection (NDEP) to treat the groundwater from the construction dewatering activities to remove perchlorate before discharging the treated water to the Las Vegas Wash.

To manage and treat groundwater from the construction activities, Tetra Tech, Inc. (Tetra Tech) designed and constructed two pump stations and a central water treatment plant (CWTP), collectively referred to as the SNWA Weir Dewatering Treatment Plant (Treatment Plant). The Treatment Plant will operate on a temporary basis, and operations will cease once groundwater dewatering associated with the SNWA weir construction projects is complete.

At the direction of NERT, Tetra Tech has prepared this summary of the operation and maintenance (O&M) activities performed during July 2018 for the Treatment Plant. The system was operated and maintained in accordance with the *NERT – SNWA Weir Dewatering Water Treatment Plant Operation and Maintenance Manual*.

SUMMARY OF O&M ACTIVITIES

During July 2018, the Treatment Plant continued to receive water from weir construction dewatering activities at Sunrise Mountain Weir. On June 4, 2018 at approximately 2:00 pm, Historic Lateral Pump Station (HLPS) was placed in standby mode following Las Vegas Paving's completion of dewatering activities at Historic Lateral Weir. On July 11, 2018, SNWA provided notice to the Trust that no additional dewatering activities were planned for the Historic Lateral Weir construction site and the HLPS was cleared for decommissioning. During July 2018, the Treatment Plant did not receive water from Historic Lateral Weir.

Tetra Tech, Inc.
150 S. 4th Street, Unit A, Henderson, NV 89015
Tel 702-854-2295 tetratech.com

OPERATIONS

Operations in July 2018 were characterized by consistent water quality with typically low suspended solids concentrations. Short intervals of high influent total suspended solids (TSS) were observed occasionally as a result of sizeable weather events and LVP construction activities disturbing soils in or near dewatering trenches and pits at the Sunrise Mountain Weir. Treatment Plant National Pollutant Discharge Elimination System (NPDES) water quality samples and influent flowrate monitoring confirmed the operations were in compliance with permit limits during the July 2018 reporting period.

Flow Rates

Flow rates for July 2018 are summarized in Table 1. This includes a summary of the flow rate into the HLPS (zero flow for the month), into the Sunrise Mountain Pump Station (SMPS), and out of the Treatment Plant.

Historic Lateral Pump Station

During July 2018, HLPS did not receive water from the Historic Lateral Weir construction site.

Sunrise Mountain Pump Station

Flow rates into the SMPS were generally consistent over the reporting period, reflecting relatively stable dewatering operations by LVP at the Sunrise Mountain Weir construction site.

Influent Parameters

Influent water quality parameters are measured daily for the water coming into each pump station. Influent water quality parameters measured include:

- Perchlorate
- Chlorate
- Total Dissolved Solids (TDS)
- Sulfate
- Nitrate

Perchlorate, chlorate, and TDS are analyzed at a certified laboratory (Test America) in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. Sulfate and nitrate are also analyzed to capture a complete evaluation of these influent parameters. Beginning March 16, 2018, both nitrate and sulfate were analyzed exclusively by the in-house laboratory. Both nitrate and sulfate are analyzed according to EPA method 300.0. These in-house procedures meet the standards specified in the approved NERT project Quality Assurance Project Plan as described in previous monthly reports.

The range and average of perchlorate concentrations observed into each pump station during the reporting period were:

- HLPS: no flow received
- SMPS: 840 to 1,690 µg/L, average: 1,061 µg/L

Table 2 contains the summary data from the daily influent parameter measurements.

Perchlorate Mass Removal Estimates

Daily perchlorate mass removal estimates were calculated from the recorded total influent flow to the SMPS and HLPS and daily measurements of perchlorate (analyzed at Test America by Method 314.0). The mass removed

was calculated based on an effluent perchlorate concentration of zero (0) µg/L. The estimated mass of perchlorate removed during July 2018 is:

- HLPS: 0 pounds
- SMPS: 850 pounds
- Total: 850 pounds

Perchlorate removal estimates have been tabulated since the startup period ended January 17, 2018. The estimated total perchlorate mass removed from January 18, 2018 through July 31, 2018 is:

- HLPS: 387 pounds
- SMPS: 5,415 pounds
- Total: 5,803 pounds

A graph showing the estimated removal of perchlorate from January 18 through July 31, 2018 is presented in the attached Figure 1.

Suspended Solids Removal and Management

The Treatment Plant was designed to remove the majority of suspended solids from the influent waters via hydrocyclones and multimedia filters (MMF). High TSS waste from the hydrocyclones are stored in the 20,000-gallon cyclone waste tank. High TSS waste from the MMFs is generated during the MMF backwash process and is stored in two 20,000-gallon backwash waste tanks. The system is designed to slowly blend in backwash waste and cyclone waste water into the treated effluent stream in small quantities to ensure the concentrations do not exceed the NPDES permit discharge limits for perchlorate (18 µg/L) and TSS (135 mg/L).

To address the ongoing significant solids loading in the waters produced from weir construction, continued use of external tanks for cyclone and backwash waste surge and storage capacity and associated decanting system occurred in July 2018. These external surge tanks are connected to the permanent cyclone and backwash waste tanks with a semi-permanent hard-pipe system to reduce the potential for releases outside of containment. The piping system maintains all pumps and connections within secondary containment and includes a pumping circuit to decant the water overlying settled solids from these tanks back into the SMPS influent tanks. In the month of July:

- 2 tanker truckloads of solids slurry were sent to the landfill, or 6,000 gallons of tanker capacity; and
- 128,100 gallons of water overlying settled solids were decanted from the surge tanks and routed back through the Treatment Plant (4,466,500 total gallons since start of decanting process).

MAINTENANCE

Maintenance performed at the Treatment Plant during the reporting period included both routine maintenance activities and non-routine maintenance activities as described in the following sections.

Routine Maintenance

Routine maintenance activities included the following:

- Generators supplying power to the SMPS, HLPS, and CWTP require service approximately every 250 hours of generator run time. Generators were serviced during the reporting period as follows:
  - XQ500 – Unit 14-165 (at CWTP), service conducted on July 3, 14, and 26, 2018.
  - XQ350 – Unit 17-248 (at SMPS), service conducted on July 3, 14, and 28, 2018.
  - XQ350 – Unit 17-250 (at SMPS), service conducted on July 11 and 28, 2018.

  - XQ350 – Unit 17-251 (at SMPS), service conducted on July 12 and 26, 2018.
- Wye strainer was flushed periodically to clear solids accumulation.
- Cyclone underflow lines were flushed periodically to clear solids accumulation.
- Cyclone valves were greased.
- Tank level sensors were cleaned.

Non-Routine Maintenance

Non-routine maintenance was performed during July 2018 to improve Treatment Plant operation, including:

- Installed new manway gasket on Multi Media Filter 1A on July 5, 2018.
- Installed new 60mL liner containment area for West decant tanks on July 6, 2018.
- Recalibrated TSS meters throughout CWTP on July 7, 2018.
- Repaired Pump 1C on July 11, 2018.
- Replaced mechanical seal on Pump 7B on July 12, 2018.
- Repaired lined containment area for East decant tanks on July 13, 2018.
- Repaired Pump 7B and put online on July 16, 2018.
- Cleaned Rinse Water Tank on July 18, 2018.
- Installed hatchway on Filter Rinse Tank TK6 on July 18, 2018.
- Reconfigured TSS meter AIT 4010 on July 20, 2018.
- Installed new flowmeter and modified piping between internal decant tanks on July 25, 2018.
- Changed ion exchange resin in vessel 1A on July 27, 2018.
- Changed ion exchange resin in vessel 1B on July 28, 2018.

O&M Costs

At the direction of the Trust, Tetra Tech has summarized cost data for the reporting period. The following table summarizes project charges in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. This section only captures project charges consistent with the O&M agreement or agreed upon charges for items supplied by/through Tetra Tech and billed to the Trust.

Table 3: O&M Cost Summary

Item	Payment Details	Unit[1]	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Monthly Base Cost	Lump sum payable to Tetra Tech	$297,500 /month	$297,500	$2,082,500

[1] Unit rates do not include applicable taxes.

Item	Payment Details	Unit[1]	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Ion Exchange Resin	Lump sum direct pay from Trust to Evoqua for turn key resin delivery, replacement, transportation and disposal services	$135,755 /vessel which includes: $109,750 /vessel for resin $26,005 /vessel for changeout services and disposal	$182,035[2]	$642,468
Tankage	Actual usage charges direct pay from Trust to vendor	Baker Corp: $20,074 /month plus variable maintenance fees as necessary Rain for Rent: Variable costs	$0[3] $32,491	$210,034
Generator Rental / Maintenance	Actual usage charges direct pay from Trust to Cashman	Rental: varies based on hours of run time and generator size Maintenance: $625 every 250 run hours per XQ350 Generator $1,250 every 250 run hours per XQ500 plus Backup generator rental costs as required to support maintenance	$0[4] (to be invoiced in August)	$41,875
Generator Fuel	Actual usage charges direct pay from Trust to Cashman	Adjusts per market	$0 (to be invoiced in August)	$563,726
Solids Disposal	Lump sum payable to Tetra Tech for off-site transportation and disposal	$4,150 /3,000-gallon tanker $6,917 /5,000-gallon tanker	$34,585	$1,509,279

[2] The equivalent of 9 vessel changeouts were paid by the Trust as part of the construction contract. This credit has been exhausted. These charges reflect additional vessel changeouts payable directly by the Trust.
[3] The Trust pre-paid a sum during Treatment Plant Construction for project tankage to obtain a discount on long-term equipment cost. As of July 31, 2018, the remaining credit balance is $55,645.98. Additional payment by the Trust will not be required until this prepayment credit is exhausted.
[4] The Trust pre-paid a sum during Treatment Plant Construction for generator rental to obtain a discount on long-term equipment cost. This credit has been exhausted. Additional costs will be payable directly by the Trust.

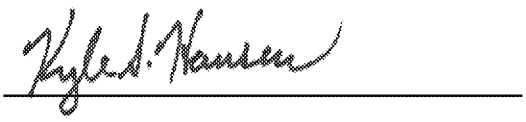
Item	Payment Details	Unit[1]	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Decanting	Daily charge payable to Tetra Tech	$10,000 /day	$10,000	$400,000
Repairs	Cost of Equipment replacement plus 5% markup payable to Tetra Tech	Ferguson Enterprises Inc: Repair/ Replacement Services	$2,378	$14,073
		TOTAL	$558,989	$5,463,955

No other items were supplied by/through Tetra Tech and billed to the Trust during this reporting period.

CERTIFICATION

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been prepared in a manner consistent with the current standards of the profession, and to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Description of Services Provided: Prepared Weir Dewatering Treatment Plant Operation and Maintenance Summary for July 2018.



August 20, 2018

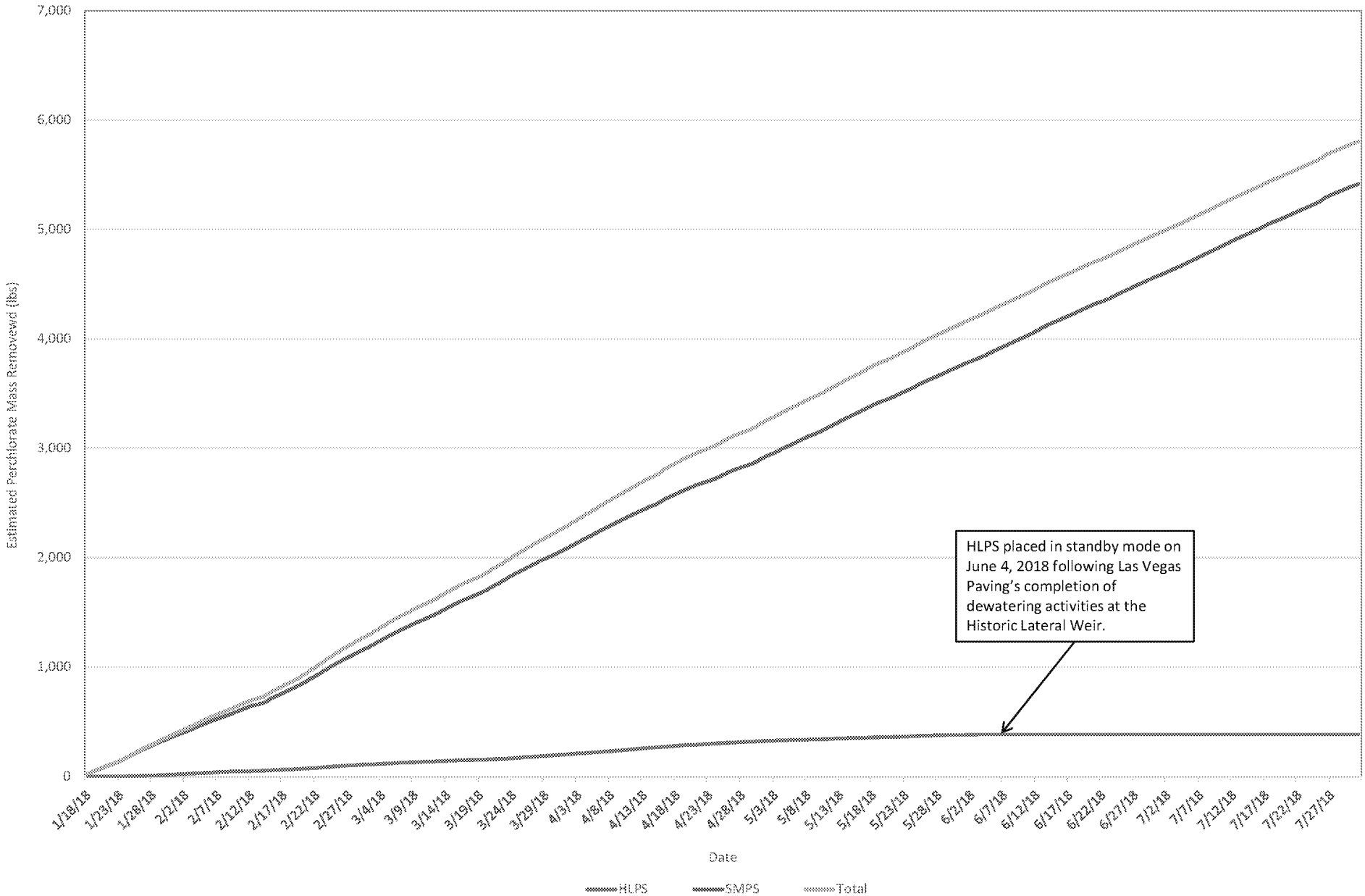
Kyle Hansen, CEM
Field Operations Manager/Geologist
Tetra Tech, Inc.

Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2020

Figures

Figure 1
Estimated Perchlorate Mass Removed January 18 - July 31, 2018



Tables

Weir Dewatering Treatment Plant
Monthly Flow Summary
July 2018
Table 1

Date	Influent						Effluent[3]	
	HLPS		SMPS		Combined Flow[1]			
	Average[2] (FIT3010) gpm	Total (FIT3010) Gallons	Average[2] (FIT2010) gpm	Total (FIT2010) Gallons	Average[2] (FIT4010) gpm	Total (FIT4010) Gallons	Average[2] (FIT8060) gpm	Total (FIT8060) Gallons
7/1/2018	0	0	2,172	3,127,900	2,167	3,120,300	2,177	3,134,300
7/2/2018	0	0	2,167	3,119,900	2,168	3,121,900	2,218	3,193,900
7/3/2018	0	0	2,189	3,151,700	2,194	3,159,600	2,200	3,167,700
7/4/2018	0	0	2,165	3,118,000	2,167	3,120,700	2,178	3,135,800
7/5/2018	0	0	2,190	3,153,300	2,180	3,138,600	2,190	3,154,200
7/6/2018	0	0	2,203	3,172,300	2,255	3,247,500	2,219	3,194,700
7/7/2018	0	0	2,157	3,105,800	2,176	3,132,800	2,181	3,140,500
7/8/2018	0	0	2,189	3,151,900	2,199	3,166,800	2,224	3,201,900
7/9/2018	0	0	2,198	3,164,400	2,179	3,137,300	2,214	3,188,300
7/10/2018	0	0	1,982	2,853,800	1,988	2,862,200	2,039	2,936,700
7/11/2018	0	0	2,385	3,434,100	2,397	3,452,100	2,407	3,466,400
7/12/2018	0	0	2,205	3,174,500	2,209	3,181,000	2,251	3,241,300
7/13/2018	0	0	2,167	3,120,600	2,173	3,129,600	2,230	3,210,900
7/14/2018	0	0	2,156	3,105,000	2,156	3,104,100	2,207	3,178,000
7/15/2018	0	0	2,209	3,181,300	2,215	3,189,300	2,249	3,238,600
7/16/2018	0	0	2,150	3,095,800	2,150	3,096,000	2,204	3,174,100
7/17/2018	0	0	2,142	3,083,900	2,157	3,105,400	2,222	3,199,300
7/18/2018	0	0	2,146	3,089,900	2,141	3,083,500	2,140	3,081,500
7/19/2018	0	0	2,143	3,085,200	2,134	3,072,900	2,194	3,159,700
7/20/2018	0	0	2,175	3,132,400	2,180	3,138,500	2,218	3,193,500
7/21/2018	0	0	2,137	3,076,900	2,144	3,087,800	2,179	3,138,300
7/22/2018	0	0	2,105	3,030,800	2,094	3,016,000	2,143	3,085,400
7/23/2018	0	0	2,085	3,002,700	2,086	3,003,600	2,133	3,071,800
7/24/2018	0	0	2,091	3,010,600	2,098	3,020,600	2,118	3,050,100
7/25/2018	0	0	2,096	3,018,700	2,092	3,012,300	2,161	3,111,300
7/26/2018	0	0	2,102	3,027,200	2,093	3,013,300	2,177	3,134,200
7/27/2018	0	0	2,102	3,026,400	2,094	3,015,200	2,160	3,109,900
7/28/2018	0	0	2,099	3,022,600	2,087	3,005,500	2,116	3,046,600
7/29/2018	0	0	2,095	3,016,100	2,094	3,015,900	2,173	3,128,800
7/30/2018	0	0	2,125	3,059,900	2,112	3,041,400	2,160	3,109,900
7/31/2018	0	0	2,129	3,065,500	2,127	3,062,300	2,201	3,169,700

Notes:
HLPS = Historic Lateral Pump Station.
SMPS = Sunrise Mountain Pump Station.
FIT numbers presented in column headers correlate with Flow Instrument Transmitter tag numbers for particular flow meters.
Combined flow totals recorded on 7/6 - 7/7, 7/11 and 7/24 inclusive of bypass of flowmeter for maintenance or recirculated flow through plant decant process.
1 - The combined feed is measured by flow indicator FIT4010. This is not equal to the sum of flows from HLPS (FIT3010) and SMPS (FIT2010) due to fluctuating volumes in influent storage tanks.
2 - Average calculated by dividing total gallons by 1,440 (minutes per 24 hours).
3 - Effluent flow meter data is higher than the combined influent flows due to inherent flowmeter variability and is compounded by batch processing operations. Air drawn into piping (as designed for vacuum breaks) at the end of each pumping batch has been observed to result in transient, short duration high flow readings that are not representative of actual flows.

No flows received into HLPS. HLPS was placed in standby mode beginning at approximately 2:00pm on June 4, 2018, with no water received at the pump station after that date. Southern Nevada Water Authority released the HLPS for dismantling on July 11, 2018 indicating no future dewatering work is planned at that location.

Weir Dewatering Treatment Plant
Influent Parameter Summary
July 2018
Table 2

		Parameter:	Perchlorate		Chlorate		Total Dissolved Solids		Nitrate as NO3		Sulfate		
		Units:	ug/L		ug/L		mg/L		mg/L		mg/L		
Location	Collection Date	Lab Sample ID	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Comment
SMPS Influent	7/1/2018	440-214871-1	962		166		2670		26.9		1130		
	7/2/2018	440-214867-1	1030		177		2630		26.6		1120		
	7/3/2018	440-215070-1	1020		178		2650		27.1		1130		
	7/4/2018	440-215076-1	1040		182		2660		27.1		1120		
	7/5/2018	440-215078-1	1080		186		2630		27.3		1130		
	7/6/2018	440-215199-1	1040		185		2650		27.1		1120		
	7/7/2018	440-215310-1	1150		185		2580		28.4		1170		
	7/8/2018	440-215308-1	1070		181		2600		27.9		1120		
	7/9/2018	440-215309-1	1100		186		2600		28.4		1130		
	7/10/2018	440-215484-1	1270		185		2790		28.1		1150		
	7/11/2018	440-215571-1	1010		135		2480		26.5		1100		
	7/12/2018	440-215720-1	1060		159	F1	2720		23.9		1140		
	7/13/2018	440-215802-1	1070		162		2670		24.1		1210		
	7/14/2018	440-215924-1	1020		188		2490		23.7		1230		
	7/15/2018	440-215926-1	995		175		2560		23.6		1130		
	7/16/2018	440-215928-1	1010		172		2640		22.4		1130		
	7/17/2018	440-216053-1	1290		161		2610		23.2		1090		
	7/18/2018	440-216185-1	990		190		2660		23.7		1180		
	7/19/2018	440-216278-1	937		164		2680		23.9		1210		
	7/20/2018	440-216358-1	1010		164		2590		24.2		1140		
	7/21/2018	440-216454-1	994		171		2760		24.0		1140		
	7/22/2018	440-216518-1	1070		175		2830		22.5		1110		
	7/23/2018	440-216452-1	1050		174		2800		23.7		1130		
	7/24/2018	440-216533-1	1060		192		2680		24.3		1150		
	7/25/2018	440-216682-1	1060		192		2710		24.4		1190		
	7/26/2018	440-216776-1	1690		198		2670		24.4		1150		
	7/27/2018	440-216871-1	1070		184		2700		25.3		1170		
	7/28/2018	440-216978-1	923		203		2650		24.4		1150		
	7/29/2018	440-216974-1	1010		195		2730		25.3		1170		
	7/30/2018	440-216975-1	975		187		2700		24.6		1140		
	7/31/2018	440-216992-1	840		187		2690		24.7		1150		

Notes:

ug/L	micrograms per liter (parts per billion)
mg/L	milligrams per liter (parts per million)
F1	Matrix Spike and/or Matrix Spike Duplicate Recovery is outside acceptance limits.
SMPS	Sunrise Mountain Pump Station

Nitrate data presented as NO_3 consistent with terms of O&M agreement.

Nitrate and sulfate analyzed exclusively by In-House Laboratory beginning 3/16/18.

No data provided for Historic Lateral Pump Station (HLPS). HLPS was placed in standby mode beginning at approximately 2:00pm on June 4, 2018, with no water received at the pump station after that date. Southern Nevada Water Authority released the HLPS for dismantling on July 11, 2018 indicating no future dewatering work was planned at that location.